

# Fisher® GX 3-Way Control Valve and Actuator System

## Contents

Introduction .....	1
Scope of Manual .....	1
Description .....	1
Specifications .....	2
Valve Installation .....	2
Maintenance .....	3
Actuator Maintenance .....	5
Packing Maintenance .....	9
Replacing Packing (Pneumatic Actuators) .....	9
Replacing Packing (Electric Actuators) .....	12
Valve Trim Maintenance .....	15
Parts Kits .....	19
Parts List .....	20

Figure 1. Fisher GX 3-Way Control Valve, Actuator, and FIELDVUE DVC2000 Digital Valve Controller



## Introduction

### Scope of Manual

This instruction manual includes installation, maintenance, and parts information for the Fisher GX 3-Way control valve and actuator system.

Do not install, operate, or maintain a GX 3-Way valve without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your Emerson Process Management sales office before proceeding.

### Description

The GX 3-Way meets the requirements of both EN and ASME standards. It is available with a complete accessory package, including the FIELDVUE™ DVC2000 integrated digital valve controller.



**Table 1. Fisher GX 3-Way Valve Specifications<sup>(1)</sup>**

Specifications	EN	ASME	
Valve Body Sizes	DN 25, 40, 50, 80, 100	NPS 1, 1-1/2, 2, 3, 4	
Pressure Rating	PN 10 / 16 / 25 / 40 per EN 1092-1	CL150 / 300 per ASME B16.34	
End Connections	Flanged raised face per EN 1092-1	Flanged raised face per ASME B16.5	
	1.0619 steel	ASME SA216 WCC steel	
Valve Body Materials	1.4409 stainless steel	ASME SA351 CF3M stainless steel	
	1.4409 stainless steel / CoCr-A	ASME SA351 CF3M SST / CoCr-A	
Face-to-Face Dimensions	Based on ISA 75.08.01, see bulletin 51.1:GX 3-Way for details		
Shutoff per IEC 60534-4 and ANSI/FCI 70-2	Metal seat - Class IV (standard) <b>Side port common high temperature construction:</b> Metal seat - Class IV for bottom seat, Class II for upper seat		
Flow Direction	Converging and Diverging		
Trim Style	Type	Plug Style	Type
	Side-Port Common	All sizes	Unbalanced Port-Guided
	Bottom-Port Common	All sizes	Balanced Cage-Guided

1. Stainless steel valve body is recommended for steam service when the high temperature (HT) construction is selected.

## Valve Installation

### **⚠ WARNING**

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

Personal injury or equipment damage caused by sudden release of pressure or bursting of pressure retaining parts might result if service conditions exceed those for which the product was intended. To avoid injury or damage, provide a relief valve for over pressure protection as required by government or accepted industry codes and good engineering practices.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the **WARNING** at the beginning of the Maintenance section in this instruction manual.

### **CAUTION**

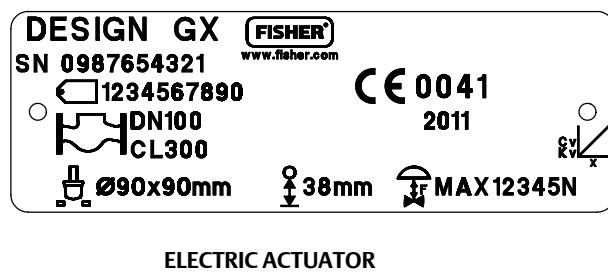
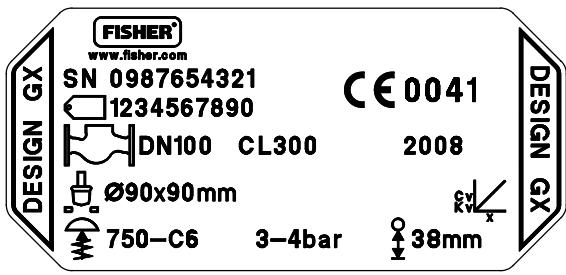
This valve is intended for a specific range of pressures, temperatures and other application specifications. Applying different pressure and temperatures to the valve could result in parts damage, malfunction of the control valve or loss of control of the process. *Do not expose this product to service conditions or variables other than those for which the product was intended.* If you are not sure what these conditions are you should contact your Emerson Process Management sales office for more complete specifications. Provide the product serial number (shown on the nameplate, figure 2) and all other pertinent information.

### **⚠ WARNING**

If you move or work on an actuator installed on a valve with loading pressure applied, keep your hands and tools away from the stem travel path to avoid personal injury. Be especially careful when removing the stem connector to release all loading on the actuator stem whether it be from air pressure on the diaphragm or compression in the actuator springs. Likewise take similar care when adjusting or removing any optional travel stop. Refer to the relevant actuator Maintenance Instructions.

If hoisting the valve take care to prevent people from being injured in case the hoist or rigging slips. Be sure to use adequately sized hoists and chains or slings to handle the valve.

Figure 2. Fisher GX 3-Way Nameplate (Key 35)



1. Before installing the valve, inspect it to be certain that the valve body cavity is free of all foreign material. Clean out all pipelines to remove scale, welding slag and other foreign material.
2. The control valve assembly may be installed in any orientation unless limited by seismic criteria. However, the normal method is with the actuator vertical above the valve. Flow through the valve must be in the direction indicated by the flow arrow nameplate on the valve. See figures 3 and 4.
3. Use accepted piping practices when installing the valve in the pipeline. Use a suitable gasket between the valve and the pipeline flanges.
4. If continuous operation is required during inspection or maintenance, install isolating valves on either side of the control valve with a bypass valve to control the flow while the control valve is receiving maintenance.

### **⚠ WARNING**

Personal injury could result from packing leakage. Valve packing is tightened before shipment; however the packing might require some readjustment to meet specific service conditions.

## Maintenance

### **⚠ WARNING**

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:

- Do not remove the actuator from the valve while the valve is still pressurized.
- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from the process pressure. Relieve the process pressure from all three inlets/outlet of the valve.
- Depending on the actuator construction, it will be necessary to manage the pneumatic actuator loading pressure and any actuator spring pre-compression. It is essential to refer to the relevant actuator instructions in this manual to ensure safe removal of the actuator from the valve.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, even when the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Figure 3. Fisher GX 3-Way Valve Bottom-Port Common Flow Direction

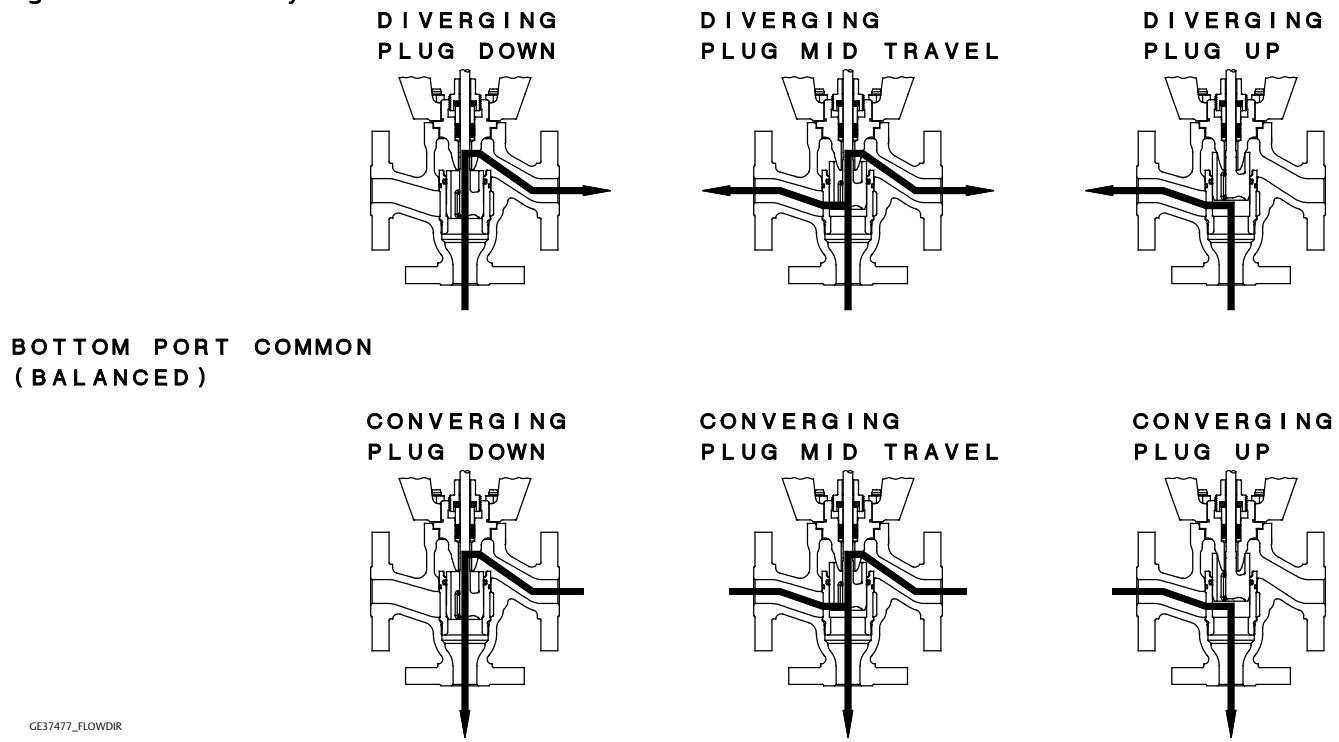
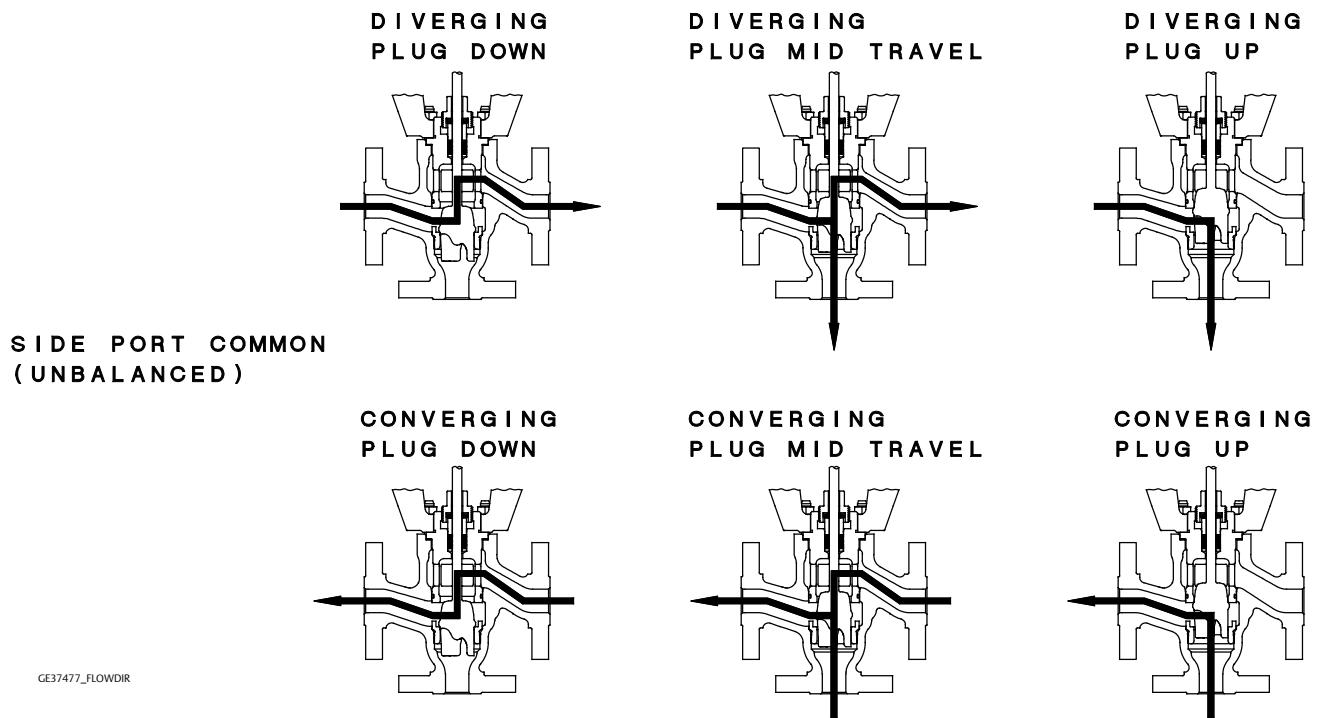


Figure 4. Fisher GX 3-Way Valve Side-Port Common Flow Direction



**Table 2. Fisher GX 3-Way Rated Travel**

VALVE SIZE NPS	ACTUATOR SIZE	NUMBER OF CASING BOLTS	TRAVEL		STEM CONNECTOR GAP SETTINGS mm
			mm	mm	
1, 1-1/2	225	6	19	21	
2	750	10	19	21	
3, 4	750	10	38	40	

**Table 3. Body Nut (Key 7) Torque Requirements**

VALVE SIZE	TORQUE	
	N·m	lbf·ft
DN 25 and 40 (NPS 1 and 1-1/2)	79.8	58.9
DN 50 (NPS 2)	163	120
DN 80 and 100 (NPS 3 and 4)	282	208

**Note**

Whenever a gasket seal is disturbed by removing or shifting gasketed parts, install a new gasket during reassembly. This ensures a good gasket seal because the used gasket may not seal properly.

## Actuator Maintenance

For electric actuators, see the supplier's instruction manual.

The following sections provide procedures for actuator maintenance. Refer to figures 8 and 11.

The actuator soft parts may require periodic replacement. This includes the diaphragm (key 10), diaphragm O-ring (key 109), actuator rod bushing (key 19), and the actuator rod seal (key 20).

If the actuator stroking direction is unknown, refer to the nameplate on top of the actuator casing and figure 2.

**Note**

When the GX 3-Way actuator is equipped with the integrated FIELDVUE DVC2000 digital valve controller (figure 1), additional considerations may be required. Refer to the FIELDVUE DVC2000 Digital Valve Controller instruction manual, D103176X012, for mounting instructions.

## Actuator Disassembly (For Fail-Down Constructions, see figure 11)

1. Connect a separate air supply to the lower diaphragm casing via the air supply connection on the yoke (as shown in figure 11) and apply sufficient air pressure to raise the valve plug/stem off the lower seat to mid-travel.
2. Remove the stem connector nut half (key 23), stem connector bolt half (key 24), and travel indicator (key 26).
3. Push the valve plug/stem (key 3) down until it contacts the seat.
4. Loosen the locknut (key 28) and thread the lower stem connector (key 27) down until it clears the top of the valve plug/stem (key 3).
  - For HT construction, loosen locknut (key 108) and thread the stem extension (key 106) down as far as possible (see figure 12).

5. Shut off the air pressure and disconnect the separate air supply to the lower diaphragm casing (as shown in figure 11).

### **⚠ WARNING**

To avoid personal injury or property damage due to actuator springs (key 12) being under compression, remove the long cap screws (key 16) last.

The upper actuator casing may remain fixed to the diaphragm and lower casing during disassembly, even if the casing cap screws have been loosened. If this happens, the actuator springs are still under compression. The upper casing could suddenly come loose and jump, due to the compressed energy of the springs. If the upper casing is stuck to the diaphragm and lower casing when you begin loosening the casing cap screws, pry the casings apart with a prying tool. Always ensure that the springs are dispersing energy and the upper casing is moving against the long bolts during disassembly.

6. Remove the **short** actuator casing cap screws and hex nuts (keys 17 and 18) first. Once these have been removed from the actuator assembly, carefully remove the **long** actuator cap screws and hex nuts (keys 16 and 18), alternating between them to gradually release the spring energy (compression).
7. Remove the upper diaphragm casing (key 9) and the actuator springs (key 12).
8. Lift off the actuator stem/diaphragm assembly (includes keys 22, 11, 10, 14, 13, 109, and 15) and remove the cap screw (key 14), actuator spacer (key 13), actuator rod (key 22), and washer (key 15).
9. Replace the diaphragm (key 10), actuator rod bushing (key 19), actuator rod seal (key 20), and diaphragm O-ring (key 109), as needed.

### **Actuator Disassembly (For Fail-Up Constructions, see figure 8)**

1. Connect a separate air supply to the air supply connection on the upper casing (shown in figure 8) and apply sufficient air pressure to move the plug/stem to mid-travel.
2. Remove the stem connector nut half (key 23), stem connector bolt half (key 24), and travel indicator (key 26).
3. Shut off the air pressure and disconnect the air supply to the upper casing.

### **⚠ WARNING**

To avoid personal injury or property damage due to actuator springs (key 12) being under compression, remove the long cap screws (key 16) last.

The upper actuator casing may remain fixed to the diaphragm and lower casing during disassembly, even if the casing cap screws have been loosened. If this happens, the actuator springs are still under compression. The upper casing could suddenly come loose and jump, due to the compressed energy of the springs. If the upper casing is stuck to the diaphragm and lower casing when you begin loosening the casing cap screws, pry the casings apart with a prying tool. Always ensure that the springs are dispersing energy and the upper casing is moving against the long bolts during disassembly.

4. Remove the **short** actuator casing cap screws and hex nuts (keys 17 and 18) first. Once these have been removed from the actuator assembly, carefully remove the **long** actuator cap screws and hex nuts (keys 16 and 18), alternating between them to gradually release the spring energy (compression).
5. Remove the upper diaphragm casing (key 9).
6. Lift off the actuator stem/diaphragm assembly (includes keys 22, 11, 10, 14, 13, 109, and 15) and remove the cap screw (key 14), actuator spacer (key 13), actuator rod (key 22), and washer (key 15).
7. Remove the actuator springs (key 12).
8. Replace the diaphragm (key 10), actuator rod bushing (key 19), actuator rod seal (key 20), and diaphragm O-ring (key 109), as needed.

## Actuator Assembly (For Fail-Down Constructions, see figure 11)

1. Install the diaphragm (key 10) on the diaphragm plate (key 11). Insert the cap screw (key 14) through the actuator spacer (key 13) and place this assembly through the diaphragm/diaphragm plate assembly.
2. Place the diaphragm O-ring (key 109) and the washer (key 15) over the center hole of the diaphragm, so that the convex part of the washer is facing down toward the diaphragm and contains the O-ring. Ensure the convex part of the washer is guided in the diaphragm center hole as shown in figure 11.
3. Screw the actuator rod (key 22) onto the cap screw (key 14) and torque to 80.0 N•m (59.1 lbf•ft). Install the actuator stem/diaphragm assembly back into the actuator yoke (key 8).
4. Place the actuator springs (key 12) onto the spring locators in the diaphragm plate (key 11).
5. Install the upper diaphragm casing (key 9) so that the ribs on the top of the upper diaphragm casing are perpendicular with the yoke legs.
6. Install the **2 long** cap screws (key 16) and hex nuts (key 18) 180 degrees apart from each other and in line with the actuator yoke legs.
7. Tighten the **long** cap screws (key 16) and hex nuts (key 18), alternating between them to gradually compress the springs, until the two casing halves and diaphragm touch.
8. Install the remaining **short** cap screws (key 17) and hex nuts (key 18) to the casing.
9. Tighten the actuator casing cap screws evenly using a cross-tightening procedure. Torque to 55 N•m (40 lbf•ft).
10. If you had previously removed the actuator assembly from the valve, place the actuator assembly back onto the valve body (key 1) or yoke extension (key 105, figure 12) for HT constructions. Install the four body nuts (key 7), but tighten them only finger-tight.
11. Connect a separate air supply to the actuator air supply connection (as shown on the yoke in figure 11) and apply sufficient air pressure to raise the actuator rod (key 22) to the travel stop.
12. Tighten the body nuts (key 7) evenly using a cross-tightening procedure. See table 3 for torque requirements.
  - For HT constructions, the valve body nuts (key 7) are tightened at the valve body (key 1) and at the top of the yoke extension (key 105), see figure 12.
13. With the valve plug/stem (key 3) on the lower seat, thread the lower stem connector (key 27) up to match the gap setting between the actuator rod and stem adjuster nut specified in table 2. Thread the locknut (key 28) up against the stem adjustor nut and tighten to a torque of 48 N•m (35 lbf•ft) for the 10mm stems or 175 N•m (129 lbf•ft) for 14mm stems.
  - For HT constructions see figure 12. With the valve plug/stem (key 3) on the lower seat, thread the stem extension (key 106) up to match the gap setting between the actuator rod and stem extension specified in table 2. Thread the locknut (key 108) up against the stem extension and tighten to a torque of 48 N•m (35 lbf•ft) for the 10mm stems or 175 N•m (129 lbf•ft) for 14mm stems.
14. Stroke the actuator rod until it contacts the lower stem connector (key 27), or the stem extension (key 106, figure 12) for HT construction, and install the stem connector halves and travel indicator (keys 23, 24, and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.
15. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
16. Tighten the stem connector cap screws (key 25) to 35 N•m (26 lbf•ft).
17. Release the actuator pressure.

## Actuator Assembly (For Fail-Up Constructions, see figure 8)

1. Position the upper diaphragm casing (key 9) upside down on the bench so that it lays flat and not off balance.

---

### Note

If converting from fail-down to fail-up action, first move the vent cap (key 21) from the top of the casing (see figure 8) and thread into the air supply connection on the yoke leg (see figure 11).

---

2. Install the diaphragm (key 10) on the diaphragm plate (key 11). Place the diaphragm O-ring (key 109) and the washer (key 15) over the center hole of the diaphragm, so that the convex part of the washer is facing down toward the diaphragm and contains the O-ring. Ensure the convex part of the washer is guided in the diaphragm center hole as shown in figure 8.
3. Insert the cap screw (key 14) through the washer and diaphragm, install the actuator spacer (key 13), and screw the actuator rod (key 22) onto the cap screw (key 14) finger-tight.
4. Radially align the spring locators in the diaphragm plate assembly (key 11) with the casing cap screw holes in the diaphragm (key 10). This will ensure that the springs do not cover the air path in the yoke.
5. Torque the cap screw (key 14) to the actuator rod (key 22) to 80.0 N•m (59.1 lbf•ft) and lay this assembly into the upper diaphragm casing (key 9).
6. Place the actuator springs (key 12) onto the spring locators in the diaphragm plate (key 11).
7. Set the actuator yoke (key 8) down onto the assembly that is resting in the upper diaphragm casing (key 9) so that the yoke legs are perpendicular with the ribs on the top of the upper diaphragm casing (key 9).
8. Install the **2 long** cap screws (key 16) and hex nuts (key 18) 180 degrees apart from each other and in line with the actuator yoke legs.
9. Tighten the **long** cap screws (key 16) and hex nuts (key 18), alternating between them to gradually compress the springs, until the two casing halves and diaphragm touch.
10. Install the remaining **short** cap screws (key 17) and hex nuts (key 18) to the casing.
11. Tighten the actuator casing cap screws evenly using a cross-tightening procedure. Torque to 55 N•m (40 lbf•ft).
12. If you had previously removed the actuator assembly from the valve, place the actuator assembly back onto the valve body (key 1) or yoke extension (key 105, figure 12) for HT construction. Install the body nuts (key 7) and tighten evenly using a cross-tightening procedure. See table 3 for torque requirements.
  - For HT constructions, see figure 12. Ensure the valve body nuts (key 7) are tightened at the valve body (key 1) and at the top of the yoke extension (key 105).
13. With the valve plug/stem (key 3) on the lower seat, thread the lower stem connector (key 27) up to match the gap setting between the actuator rod and stem adjustor nut specified in table 2. Thread the locknut (key 28) up against the stem locknut and tighten to a torque of 48 N•m (35 lbf•ft) for 10mm stems or 175 N•m (129 lbf•ft) for 14mm stems.
  - For HT constructions see figure 12. With the valve plug/stem (key 3) on the lower seat, thread the stem extension (key 106) up to match the gap setting between the actuator rod and stem extension specified in table 2. Thread the locknut (key 108) up against the stem extension and tighten to a torque of 48 N•m (35 lbf•ft) for the 10mm stems or 175 N•m (129 lbf•ft) for 14mm stems.
14. Stroke the actuator rod until it contacts the lower stem connector (key 27), or stem extension (key 106, figure 12), and install the stem connector halves and travel indicator (keys 23, 24, and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.

15. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
16. Tighten the stem connector cap screws (key 25) to 35 N•m (26 lbf•ft).

**Note**

For fail-up action, the air supply tubing must be connected to the actuator upper casing at the air supply connection, see figure 8. (If converting from fail-down to fail-up, the tubing will need to be re-routed to this location).

---

## Packing Maintenance

Key numbers refer to figure 7.

### Packing Adjustment

For spring-loaded single PTFE V-ring packing (figure 7) or for graphite ULF packing (figure 7), the Belleville spring pack (key 34) maintains a sealing force on the packing. If leakage is detected around the packing follower (key 29) check to be sure that the packing follower (key 29) is tight. Using a wrench, tighten the packing follower (key 29) in 1/4 turn intervals until the leakage is stopped. If leakage cannot be stopped in this manner, proceed to the Replacing Packing section in this manual.

## Replacing Packing (Pneumatic Actuators)

Isolate the control valve from the line pressure, release pressure from all three inlets/outlets of the valve body and drain the process media from the valve. Shut off all pressure lines to the actuator and release all pressure from the actuator. Use lock-out procedures to ensure that the above measures stay in effect while you work on the equipment.

### 1. For fail-down constructions, as shown in figure 11:

- a. Connect a separate air supply to the lower diaphragm casing via the air supply connection on the yoke (as shown in figure 11) and apply sufficient air pressure to raise the valve plug/stem off the lower seat to mid travel.
- b. Remove the stem connector nut half (key 23), stem connector bolt half (key 24), and travel indicator (key 26).
- c. Push the valve plug stem (key 3) down until it contacts the lower seat.
- d. Loosen the locknut (key 28) and thread the lower stem connector (key 27) down until it clears the top of the valve plug stem (key 3).
  - For HT construction, loosen locknut (key 108) and thread the stem extension (key 106) down as far as possible (see figure 12).
- e. Shut off the air pressure and disconnect the separate air supply to the lower diaphragm casing (as shown in figure 11).

**⚠ WARNING**

To avoid personal injury or property damage by uncontrolled movement of the actuator yoke (key 8), loosen the body/yoke nuts (figure 11, key 7) by following the instructions in the next step. Do not remove a stuck actuator yoke by pulling on it with equipment that can stretch or store energy in any other manner. The sudden release of stored energy can cause uncontrolled movement of the actuator yoke.

---

**Note**

The following step also provides additional assurance that the valve body fluid pressure has been relieved.

**2. For fail-up constructions, as shown in figure 8:**

- a. Connect a separate air supply to the air supply connection on the upper casing (shown in figure 8) and apply sufficient air pressure to move the plug/stem to mid-travel.
  - b. Remove the stem connector nut half (key 23), stem connector bolt half (key 24), and travel indicator (key 26).
  - c. Shut off the air pressure and disconnect the air supply to the upper casing.
3. Valve body nuts (key 7) attach the actuator yoke (key 8) to the valve body (key 1). Loosen these nuts approximately 3mm (1/8 inch).
- **For HT constructions,** see figure 12. Nuts (key 7) attach the yoke extension (key 105) to the valve body (key 1). Loosen these nuts approximately 3mm (1/8 inch). It is not necessary to loosen the nuts which attach the actuator yoke (key 8) to the yoke extension.
4. Then loosen the valve-to-yoke gasketed joint by either rocking the actuator yoke or prying between the valve and yoke. Work the prying tool around the yoke until it loosens.

**WARNING**

If there is evidence of process fluid under pressure leaking from the joint, retighten the valve body/joint nuts and return to the Warning at the beginning of the Maintenance section to ensure proper steps have been taken to isolate the valve and relieve process pressure.

5. If no fluid leaks from the joint, loosen the packing follower (key 29) two turns to relieve the packing compression load.
6. Remove the body nuts (key 7) completely.

**CAUTION**

To avoid property damage, place the actuator yoke on a protective surface, as described in the following procedure.

7. Carefully lift off the actuator and set it on a protective surface to prevent damage. If the bonnet (key 4) together with the valve stem plug assembly has a tendency to lift with the actuator, ensure it does not drop from the actuator.
8. Remove the lower stem connector (key 27) and locknut (key 28).
  - **For HT constructions,** see figure 12. Remove the stem extension (key 106) and locknut (key 108).
9. Remove the bonnet and the valve plug/stem assembly and set on a protective surface.
10. Remove the valve/yoke gasket (key 5) and cover the opening of the valve to protect the gasket surface and prevent foreign matter from getting into the valve cavity.
11. Remove the packing follower (key 29) from the bonnet (key 4).

12. Remove the Belleville spring pack (key 34) and packing spacer (key 30) from the bonnet (key 4). Carefully push out the remaining packing box parts from the bonnet (key 4) using a rounded rod or other tool which will not scratch the packing box wall. Clean the packing box and the metal packing box parts.

## CAUTION

**Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing.**

13. Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing. If the surface condition cannot be improved by light sanding, replace the damaged parts.
14. Remove the covering protecting the valve cavity and install a new valve/yoke gasket (key 5) making sure that the gasket seating surfaces are clean and smooth.

**Table 4. Packing Follower Torque**

Valve Size	Packing Style	Torque N·m (lbf·ft)	Packing Style	Torque N·m (lbf·ft)
DN25 and 40	PTFE	10 (7.4)	ULF	35 (26)
DN50, 80, and 100	PTFE	23 (17)	ULF	50 (37)

15. Install a new O-ring (key 81) in the groove on the bottom of the side-port common bonnet (key 4). See figure 9. Apply a general purpose silicone base lubricant.
- **For HT constructions,** see figure 12. Install a new graphite seal ring (key 107). Apply a general purpose silicone base lubricant.
16. Carefully install the bonnet (key 4) onto the valve stem.
17. Install the new packing and the metal packing box parts according to figure 7 for PTFE packing and according to figure 7 for Graphite ULF packing. Place a smooth-edged pipe over the valve stem and gently tap each soft packing part into the packing box. Apply anti-seize lubricant to the threads and install the packing follower (key 29).
18. Install the locknut (key 28) and lower stem connector (key 27). Install the valve plug/bonnet sub assembly into the valve body (key 1).
- **For HT constructions,** see figure 12. Install the locknut (key 108) and stem extension (key 106). Install the valve plug/bonnet sub assembly into the valve body (key 1).
19. Mount the actuator onto the valve and install the body nuts (figure 8 key 7), but tighten them only finger-tight.
20. **For fail-down constructions,** connect a separate air supply to the lower diaphragm casing air supply connection (as shown in figure 11) and apply sufficient air pressure to raise the actuator rod (key 22) to the travel stop. Proceed to the next step.  
**For fail-up constructions,** proceed to the next step.
21. Tighten the valve body nuts (key 7) evenly using a cross-tightening procedure. See table 3 for torque requirements.
- **For HT constructions,** see figure 12. Ensure the valve body nuts (key 7) are tightened at the valve body (key 1) and at the top of the yoke extension (key 105).
22. Thread the lower stem connector (key 27) up to match the gap setting between the actuator rod and stem adjustor nut specified in table 2. Thread the locknut (key 28) up against the stem locknut and tighten to a torque of 48 N·m (35 lbf·ft) for 10mm stems or 175 N·m (129 lbf·ft) for 14mm stems.
- **For HT constructions** see figure 12. With the valve plug/stem (key 3) on the lower seat, thread the stem extension (key 106) up to match the gap setting between the actuator rod and stem extension specified in

- table 2. Thread the locknut (key 108) up against the stem extension and tighten to a torque of 48 N•m (35 lbf•ft) for the 10mm stems or 175 N•m (129 lbf•ft) for 14mm stems.
23. Stroke the actuator rod until it contacts the lower stem connector (key 27) or stem extension (key 106, figure 12) and install the stem connector halves and travel indicator (keys 23, 24, and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.
  24. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
  25. Tighten the stem connector cap screws (key 25) to 35 N•m (26 lbf•ft).
  26. Tighten the packing follower (key 29) to the torque specified in table 4.
- Alternately, the packing follower can be tightened by the following method:
- a. Tighten the packing follower until the Belleville springs are compressed 100% (or completely flat), as detected by a rapid increase in nut torque.
  - b. Loosen the packing follower 60° of rotation.
27. **For fail-down constructions**, release the actuator pressure.
  28. **For fail-down constructions**, ensure the vent (key 21) is installed into the upper diaphragm casing (see figure 11).
  29. **For fail-up constructions**, ensure the vent (key 21) is installed into the actuator yoke air supply connection. See figure 8.

## Replacing Packing (Electric Actuators)

Isolate the control valve from the line pressure, release pressure from all three inlets/outlets of the valve body and drain the process media from the valve. Use lock-out procedures to ensure that the above measures stay in effect while you work on the equipment.

1. Stroke the actuator so the valve plug/stem (key 3) is at mid travel.
2. Remove the stem connector nut half (key 23), stem connector bolt half (key 24), and travel indicator (key 26).
3. Use precaution to ensure the actuator is locked in position and cannot stroke.
4. Mark the position of the locknut (key 28) on the stem for reassembly.
5. Push the valve plug stem (key 3) down until it contacts the lower seat.
6. Loosen the locknut (key 28) and thread the lower stem connector (key 27) down until it clears the top of the valve plug stem (key 3).
  - **For HT construction**, loosen locknut (key 108) and thread the stem extension (key 106) down as far as possible (see figure 12).

### **WARNING**

To avoid personal injury or property damage by uncontrolled movement of the actuator yoke (key 8), loosen the body/yoke nuts (figure 11, key 7) by following the instructions in the next step. Do not remove a stuck actuator yoke by pulling on it with equipment that can stretch or store energy in any other manner. The sudden release of stored energy can cause uncontrolled movement of the actuator yoke.

### Note

The following step also provides additional assurance that the valve body fluid pressure has been relieved.

7. Valve body nuts (key 7) attach the actuator yoke (key 8) to the valve body (key 1). Loosen these nuts approximately 3mm (1/8 inch).
  - For HT constructions, see figure 12. Nuts (key 7) attach the yoke extension (key 105) to the valve body (key 1). Loosen these nuts approximately 3mm (1/8 inch). It is not necessary to loosen the nuts which attach the actuator yoke (key 8) to the yoke extension.
8. Then loosen the valve-to-yoke gasketed joint by either rocking the actuator yoke or prying between the valve and yoke. Work the prying tool around the yoke until it loosens.

**⚠ WARNING**

If there is evidence of process fluid under pressure leaking from the joint, retighten the valve body/joint nuts and return to the Warning at the beginning of the Maintenance section to ensure proper steps have been taken to isolate the valve and relieve process pressure.

---

9. If no fluid leaks from the joint, loosen the packing follower (key 29) two turns to relieve the packing compression load.
10. Remove the body nuts (key 7) completely.

**CAUTION**

To avoid property damage, place the actuator yoke on a protective surface, as described in the following procedure.

---

11. Carefully lift off the actuator and set it on a protective surface to prevent damage. If the bonnet (key 4) together with the valve stem plug assembly has a tendency to lift with the actuator, ensure it does not drop from the actuator.
12. Remove the lower stem connector (key 27) and locknut (key 28).
  - For HT constructions, see figure 12. Remove the stem extension (key 106) and locknut (key 108).
13. Remove the bonnet and the valve plug/stem assembly and set on a protective surface.
14. Remove the valve/yoke gasket (key 5) and cover the opening of the valve to protect the gasket surface and prevent foreign matter from getting into the valve cavity.
15. Remove the packing follower (key 29) from the bonnet (key 4).
16. Remove the Belleville spring pack (key 34) and packing spacer (key 30) from the bonnet (key 4). Carefully push out the remaining packing box parts from the bonnet (key 4) using a rounded rod or other tool which will not scratch the packing box wall. Clean the packing box and the metal packing box parts.

**CAUTION**

Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing.

---

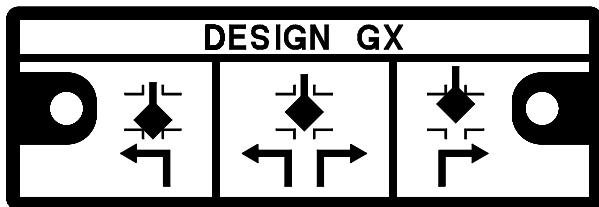
17. Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing. If the surface condition cannot be improved by light sanding, replace the damaged parts.
18. Remove the covering protecting the valve cavity and install a new valve/yoke gasket (key 5) making sure that the gasket seating surfaces are clean and smooth.

19. Install a new O-ring (key 81) in the groove on the bottom of the side-port common bonnet (key 4). See figure 9. Apply a general purpose silicone base lubricant.
    - For HT constructions, see figure 12. Install a new graphite seal ring (key 107). Apply a general purpose silicone base lubricant.
  20. Carefully install the bonnet (key 4) onto the valve stem.
  21. Install the new packing and the metal packing box parts according to figure 7 for PTFE packing and according to figure 7 for Graphite ULF packing. Place a smooth-edged pipe over the valve stem and gently tap each soft packing part into the packing box. Apply anti-seize lubricant to the threads and install the packing follower (key 29).
  22. Install the locknut (key 28) and lower stem connector (key 27). Ensure they are aligned with the mark made on the stem disassembly and tighten. Install the valve plug/bonnet sub assembly into the valve body (key 1).
    - For HT constructions, see figure 12. Install the locknut (key 108) and stem extension (key 106). Install the valve plug/bonnet sub assembly into the valve body (key 1).
  23. Mount the actuator onto the valve and install the body nuts (figure 8 key 7), but tighten them only finger-tight.
  24. Tighten the valve body nuts (key 7) evenly using a cross-tightening procedure. See table 3 for torque requirements.
    - For HT constructions, see figure 12. Ensure the valve body nuts (key 7) are tightened at the valve body (key 1) and at the top of the yoke extension (key 105).
  25. Push the valve plug/stem to the valve seat. Thread the lower stem connector (key 27) and the locknut (key 28) to the previously marked position and tighten to a torque of 48 N•m (35 lbf•ft) for 10mm stems or 175 N•m (129 lbf•ft) for 14mm stems.
    - For HT constructions see figure 12. With the valve plug/stem (key 3) on the lower seat, thread the stem extension (key 106) and the locknut (key 108) to the previously marked position and tighten to a torque of 48 N•m (35 lbf•ft) for the 10mm stems or 175 N•m (129 lbf•ft) for 14mm stems.
  26. Stroke the actuator rod until it contacts the lower stem connector (key 27) or stem extension (key 106, figure 12) and install the stem connector halves and travel indicator (keys 23, 24, and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.
  27. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
  28. Tighten the stem connector cap screws (key 25) to 35 N•m (26 lbf•ft).
  29. Tighten the packing follower (key 29) to the torque specified in table 4.
- Alternately, the packing follower can be tightened by the following method:
- a. Tighten the packing follower until the Belleville springs are compressed 100% (or completely flat), as detected by a rapid increase in nut torque.
  - b. Loosen the packing follower 60° of rotation.
30. Ensure that the electric actuator maximum thrust output does not exceed the values in table 5.

**Table 5. GX 3-Way Electric Actuator Maximum Allowable Thrust**

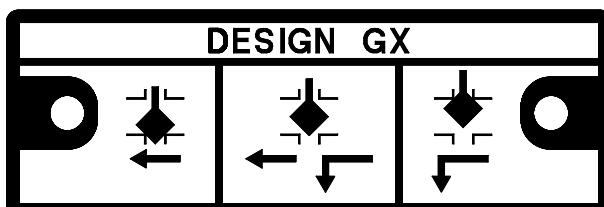
VALVE SIZE	STEM DIAMETER	TRAVEL	STEM MATERIAL	MAXIMUM THRUST FOR ACTUATOR TRAVEL UP AND DOWN	
				mm	lbf
DN25-DN40 (NPS 1 to 1-1/2)	10	19	316L SST	6900	1550
DN50 (NPS 2)	14	19	316L SST	14000	3150
DN80-DN100 (NPS 3 to 4)	14	38	316L SST	14000	3150

---

Figure 5. Fisher GX 3-Way Flow Direction Nameplate

GE37477\_BP\_PLAT

BOTTOM-PORT COMMON



GE37477\_SP\_PLAT

SIDE-PORT COMMON

## Valve Trim Maintenance

Key numbers in this section refer to figures 9 and 10. Reference the flow direction nameplate (figure 5) to determine side-port common (unbalanced) or bottom-port common (balanced) trim style.

### Side-Port Common and Bottom-Port Common Trim Disassembly

1. Remove the actuator and bonnet assembly as described in the Replacing Packing section (steps 1 through 10).

#### CAUTION

Use care to avoid damaging the gasket sealing surfaces.

The surface finish of the valve stem (key 3) is critical for making a good packing seal. The seating surfaces of the seat ring or cage (key 2) and the valve plug (key 3) are critical for tight shutoff and should therefore also be treated with care and properly protected.

1. Packing parts can be removed from the bonnet if desired. Replace these parts as described in the section on Packing Maintenance.
2. Use a seat ring or cage tool made according to the dimensions in figure 6 and table 6 to remove the seat ring or cage (key 2) as follows:
  - a. Insert the tool into the valve body. Be certain the tool lugs are engaged in the corresponding recesses in the seat ring or cage.
  - b. Use care to avoid damaging or scratching the bonnet and cage guide surfaces (see figures 9 and 10).
  - c. Use a torque gun or driver having sufficient torque capabilities according to table 7. Connect the gun to a socket that snugly fits the hex head on the seat ring or cage tool.

- d. Insert the socket onto the hex head of the seat ring or cage tool.

### **⚠ WARNING**

Be careful to hold the torque gun, attached socket, and tool at right angles to the seat ring or cage when applying torque. Tilting the gun and socket while applying torque may cause the lugs on the seat ring or cage tool to suddenly disengage from the lugs on the seat ring or cage thus causing possible damage to the seat ring or cage and possible personal injury.

3. Remove the seat ring or cage (key 2) from the valve body.
4. Inspect parts for wear or damage that would prevent proper operation of the valve.

## Side-Port Common Trim Assembly

Refer to figure 9.

1. Before installing the new seat ring, thoroughly clean the threads in the valve body. Apply suitable lubricant to the threads and to the radius surface of the seat ring (key 2). Screw the seat ring into the valve body. Using the seat ring tool, tighten the seat ring and torque according to the values in table 7. Remove all excess lubricant after tightening.
2. Clean the body/yoke gasket surfaces and install a new body/yoke gasket (key 5).
3. Remove any protective tape or covering from the valve plug/stem assembly.
4. Insert the plug/stem assembly into the seat ring.
5. Install a new bonnet O-ring (key 81) in the groove on the bonnet (see figure 9). Apply a general purpose silicone-based lubricant.
  - For HT constructions, see figure 12. Install a new graphite seal ring (key 107) in the groove on the bonnet. Apply a general purpose silicone lubricant.

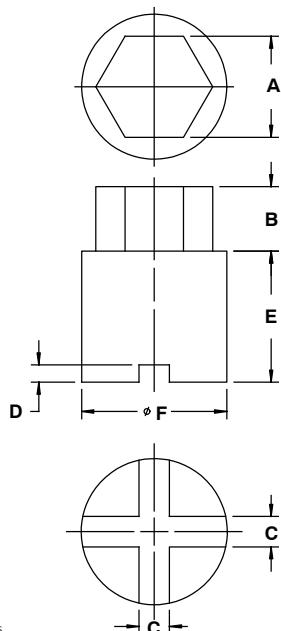
### **CAUTION**

If the packing is to be reused and was not removed from the bonnet, perform the following step carefully to avoid damaging the packing with the stem threads.

6. Install bonnet, and actuator yoke onto the valve body by completing the assembly according to steps 14 to 27 of the section Replacing Packing, omitting step 17 if new packing is not being installed.

## Bottom Port Common Trim Assembly

1. Once the seal ring (key 37) is removed, the elastomeric backup ring (key 38) can be pried from the groove.
2. To install a new backup ring (key 38) and seal ring (key 37) into the cage (key 2), apply a general purpose silicone-based lubricant. Slide the backup ring into the cage and into the groove. Slide the seal ring from the top into the cage over the backup ring.
3. Install a new cage O-ring (key 81) in the outer groove on the cage (see figure 10). Apply a general purpose silicone-based lubricant.
4. Before installing a new cage, thoroughly clean the threads in the valve body. Apply a suitable lubricant to the threads and to the radius surface of the cage (key 2). Screw the cage into the valve body. Using the cage tool, tighten the cage and torque according to the values in table 7. Remove all excess lubricant after tightening.

**Figure 6. Seat Ring or Cage Removal and Installation Tool****Table 6. Seat Ring or Cage Driver Dimensions**

Valve Size		Part Number	A	B	C	D	E	F $\emptyset$
DN	NPS		mm					
<b>Side-Port Common</b>								
25	1	GE36717X012	36	20	2X 13.2	7.5	100	53
40	1-1/2	GE36717X022	46	28	2X 13.2	7.5	105	63
50	2	GE36717X032	60	36	2X 15.2	8.5	121.5	93
80	3	GE36717X042	70	44	2X 17.2	9.5	169	113
100	4	GE36717X042	70	44	2X 17.2	9.5	169	113
<b>Bottom-Port Common</b>								
25	1	GE02918X022	36	20	2X 13.2	7.5	58	53
40	1-1/2	GE02918X032	46	28	2X 13.2	7.5	63	63
50	2	GE02918X042	60	36	2X 15.2	8.5	80	93
80	3	GE02918X052	70	44	2X 17.2	9.5	105	113
100	4	GE02918X052	70	44	2X 17.2	9.5	105	113

**Table 7. Seat Ring and Cage Torque Requirements**

VALVE SIZE		TORQUE	
DN	NPS	N·m	lbf·ft
25	1	320	234
40	1-1/2	460	337
50	2	1020	747
80 and 100	3 and 4	1520	1113

5. Clean the body/yoke gasket surfaces and install a new body/yoke gasket (key 5).

6. Remove any protective tape or covering from the valve plug/stem assembly.

**CAUTION**

**Be careful when inserting the plug/stem assembly into the cage. Lower the plug into the cage slowly as this will seat the seal ring to the plug. Make sure the seal ring (key 37) or backup ring (key 38) does not become disengaged from the cage groove.**

7. To insert the plug/stem assembly (key 3) into the cage (key 2), apply a general purpose silicone-based lubricant. Slowly insert the plug/stem assembly into the cage.

**CAUTION**

**If the packing is to be reused and was not removed from the bonnet, perform the following step carefully to avoid damaging the packing with the stem threads.**

8. Insert the bonnet and actuator yoke onto the valve body by completing the assembly according to steps 14 to 27 of the section Replacing Packing, omitting step 17 if new packing is not being installed.

## Parts Ordering

Each valve is assigned a serial number which can be found on the valve or on the nameplate (figure 2 and key 35, not shown). The nameplate will normally be fitted to the actuator. Refer to this serial number when contacting your Emerson Process Management sales office for technical assistance. When ordering replacement parts refer to this serial number and give the part description from the following parts list.

**⚠ WARNING**

**Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.**

## Parts Kits

### Packing Kits

PACKING KITS	Valve Size Stem Diameter	DN 25 and 40 (NPS 1 and 1-1/2) 10 mm	DN 50, 80 and 100 (NPS 2, 3 and 4) 14 mm
	PTFE packing (Contains keys 32 and 33)	RGXPACKX012	RGXPACKX022
	Graphite ULF packing (Contains keys 42, 43, and 44)	RGXPACKX032	RGXPACKX042

### Actuator Kits

ACTUATOR KITS	Actuator Size	225	750
	Actuator (Contains keys 10, 19, 109, and 20)	RGX225X0022	RGX750X0032

### Bottom-Port Common Seal Kits

BOTTOM-PORT COMMON SEAL KITS <sup>(1)</sup>	Valve Size	DN 25 (NPS 1)	DN 40 (NPS 1-1/2)	DN 50 (NPS 2)	DN 80 and 100 (NPS 3 and 4)
	Nitrile (Contains keys 37 and 38)	RGX3WAYX012	RGX3WAYX042	RGX3WAYX072	RGX3WAYX102
	Ethylene Propylene (EPDM) (Contains keys 37 and 38)	RGX3WAYX022	RGX3WAYX052	RGX3WAYX082	RGX3WAYX112
	FKM Fluorocarbon (Contains keys 37 and 38)	RGX3WAYX032	RGX3WAYX062	RGX3WAYX092	RGX3WAYX122

1. A Gasket Kit is required when replacing the seals.

### Bonnet and Cage O-Rings (not used on HT constructions)

BONNET AND CAGE O-RINGS <sup>(1)</sup>	Valve Size	DN 25 (NPS 1)	DN 40 (NPS 1-1/2)	DN 50 (NPS 2)	DN 80 and 100 (NPS 3 and 4)
	Nitrile O-ring (Contains key 81)	GE29466X012	GE29467X012	GE29468X012	GE29469X012
	Ethylene Propylene O-ring (EPDM) (Contains key 81)	GE29466X022	GE29467X022	GE29468X022	GE29469X022
	FKM Fluorocarbon O-ring (Contains key 81)	GE29466X032	GE29467X032	GE29468X032	GE29469X032

1. The bonnet O-ring applies to Side-Port Common trim. The cage O-ring applies to Bottom-Port Common trim.

### Seal Rings (HT Construction Only)

SEAL RINGS	Valve Size	DN 25 (NPS 1)	DN 40 (NPS 1-1/2)	DN 50 (NPS 2)	DN 80 and 100 (NPS 3 and 4)
	Graphite Seal Ring (Contains key 107)	GE49062X012	GE49063X012	GE49064X012	GE49065X012

### Gasket Kits

GASKET KITS	Valve Size	DN 25 (NPS 1)	DN 40 (NPS 1-1/2)	DN 50 (NPS 2)	DN 80 (NPS 3)	DN 100 (NPS 4)
	Body / Bonnet Gasket Kit (Graphite Laminate) (Contains key 5)	GE00078X012	GE00079X012	GE00080X012	GE00052X012	GE00052X012

## Parts List

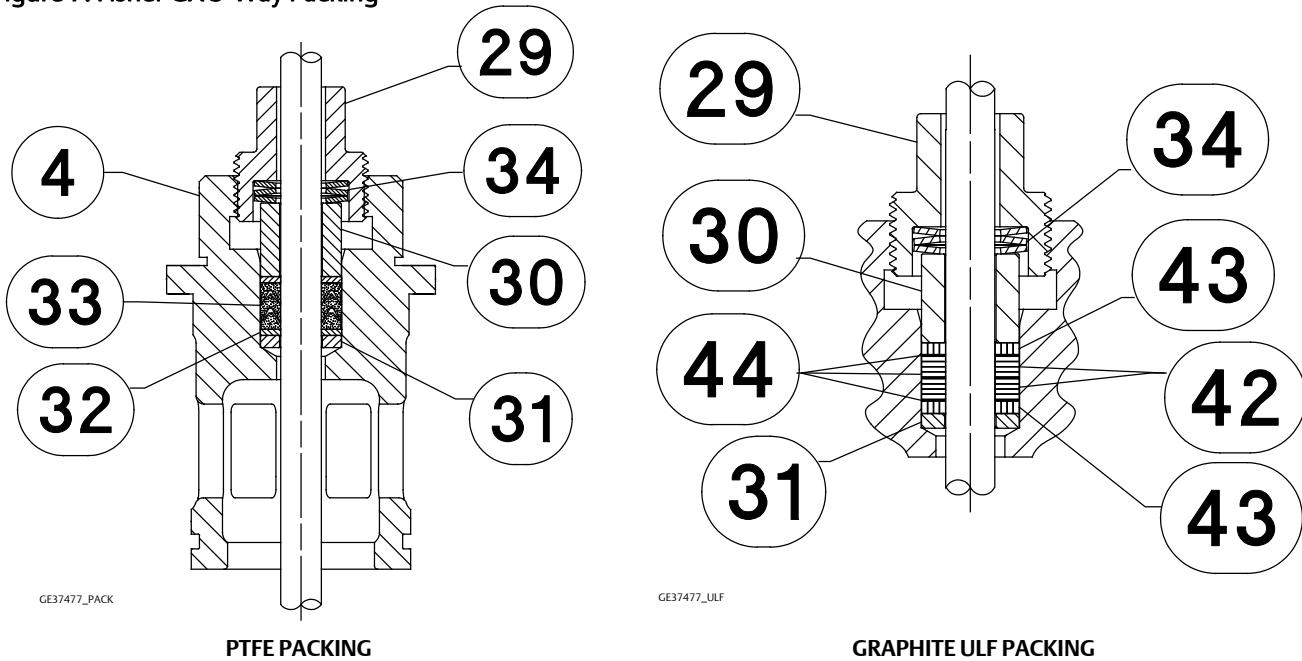
### Note

For part numbers not shown, contact your Emerson Process Management sales office.

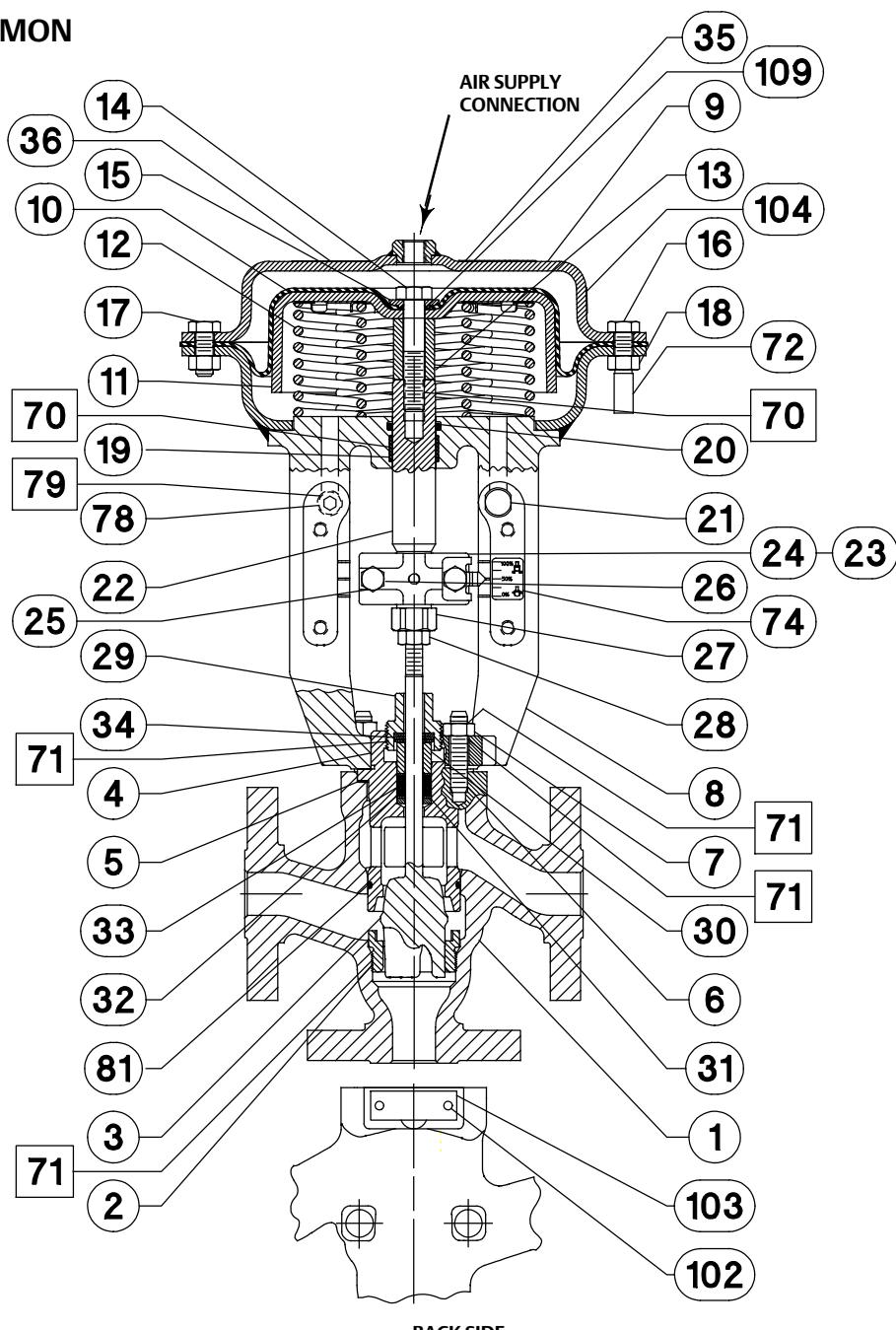
### Key Description

1	Valve Body
2*	Seat Ring or Cage
3*	Valve Plug/Stem
4	Bonnet
5*	Body/Bonnet Gasket, graphite laminate
6	Body/Bonnet Bolting
7	Body/Bonnet Nut
8	Actuator Yoke
9	Upper Diaphragm Casing
10*	Diaphragm
11	Diaphragm Plate
12	Actuator Springs
13	Actuator Spacer
14	Cap Screw
15	Washer
16	Cap Screw, long
17	Cap Screw, short
18	Hex Nut
19*	Yoke Bushing
20*	O-ring
21	Vent Cap
22	Actuator Rod
23	Stem Connector Nut Half
24	Stem Connector Bolt Half
25	Cap Screw
26	Travel Indicator
27	Lower Stem Connector
28	Hex Nut
29	Packing Nut
30	Packing Spacer
31	Packing Box Ring
32*	Anti-Extrusion Washer
33*	Packing Set
34	Belleville Spring
35	Nameplate
36	Warning Label

Key	Description
37*	Seal Ring
38*	Backup Ring
42	Packing Set
43	Packing Set
44	Packing Washer
53	Handjack Body
54	Handjack Lever
55	Operating Nut
56	Drive Screw
57	Drive Screw Washer
58	Retaining Ring, Extension
59	Thrust Bearing
60	Pin Pivot
61	Bushing
62	Retaining Ring, Extension
63	Lever Spacer
64	Hex Head Cap Screw
66	Hex Head Cap Screw
68	Stud Bolt, Continuous Thread
70	Lubricant, Lithium Grease
71	Lubricant, Anti-Seize
72	Cap Plug
74	Travel Indicator Scale
75	Lubricant Fitting, Straight
76	Handwheel
77	Hex Nut, Lock
78	Pipe Plug
81*	Bonnet / Cage O-ring
91	Protection Plate
96	Cap Screw
97	Warning Label
99	Travel Stop Assy
101	Travel Stop Warning Tag
102	Drive Screw
103	Flow Arrow
105	Yoke Extension
106	Stem Extension
107*	Graphite Seal Ring
108	Hex Nut
109*	O-ring
110	Rod Adaptor
111	Stud
112	Nut
113	Drive Screw
114	Electric Actuator Spacer
115	Lead Seal and Wire (not shown)

**Figure 7. Fisher GX 3-Way Packing**

---

Figure 8. Fisher GX 3-Way Control Valve and Actuator System Assembly, Fail-Up, Side-Port Common**SIDE-PORT COMMON**

APPLY LUBRICANT

GE35775-D

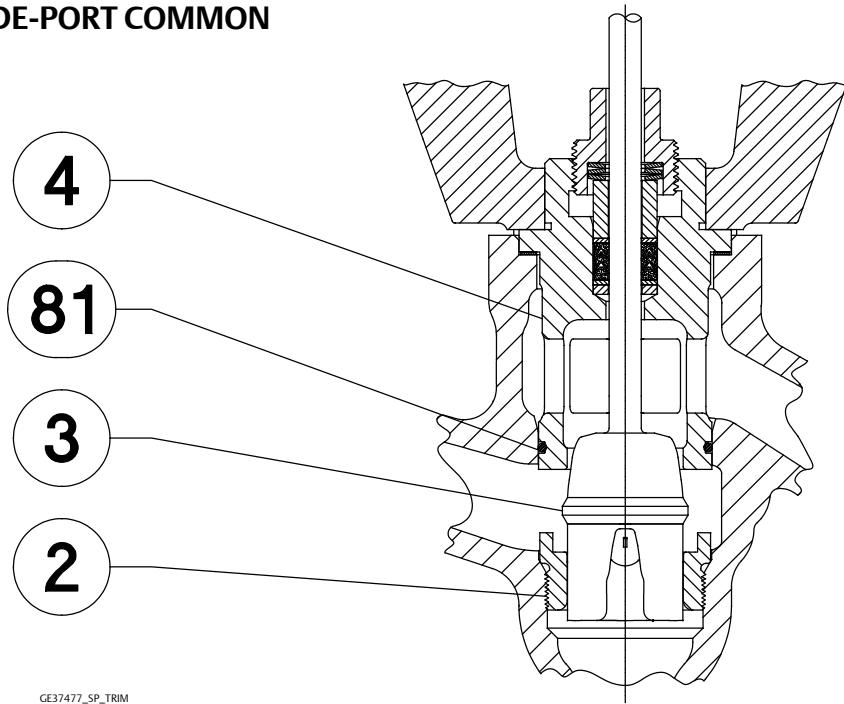
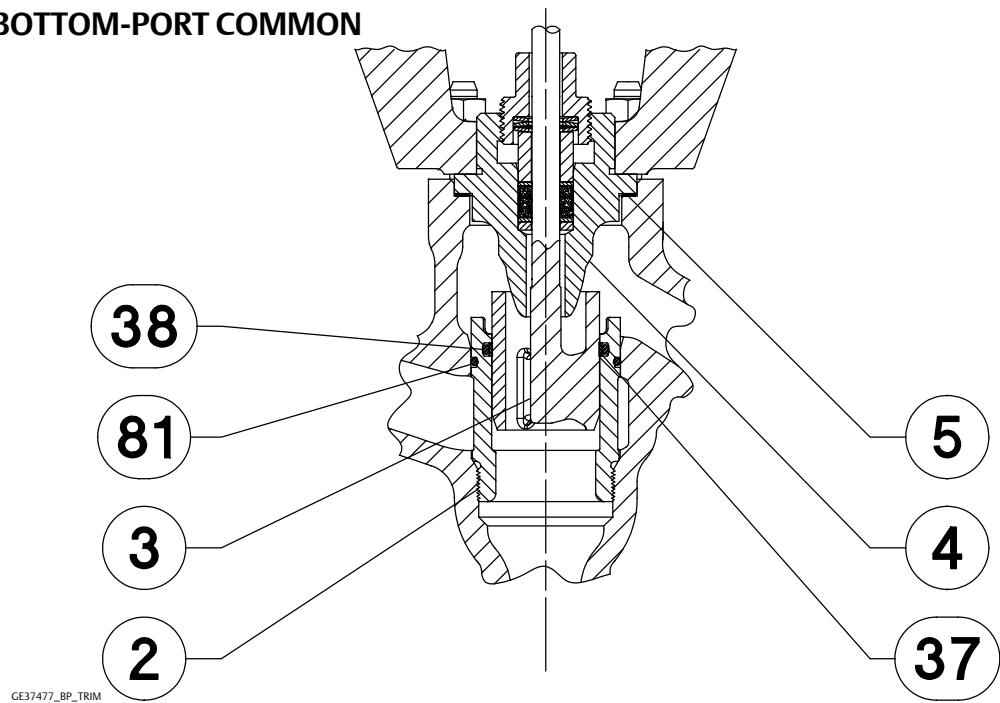
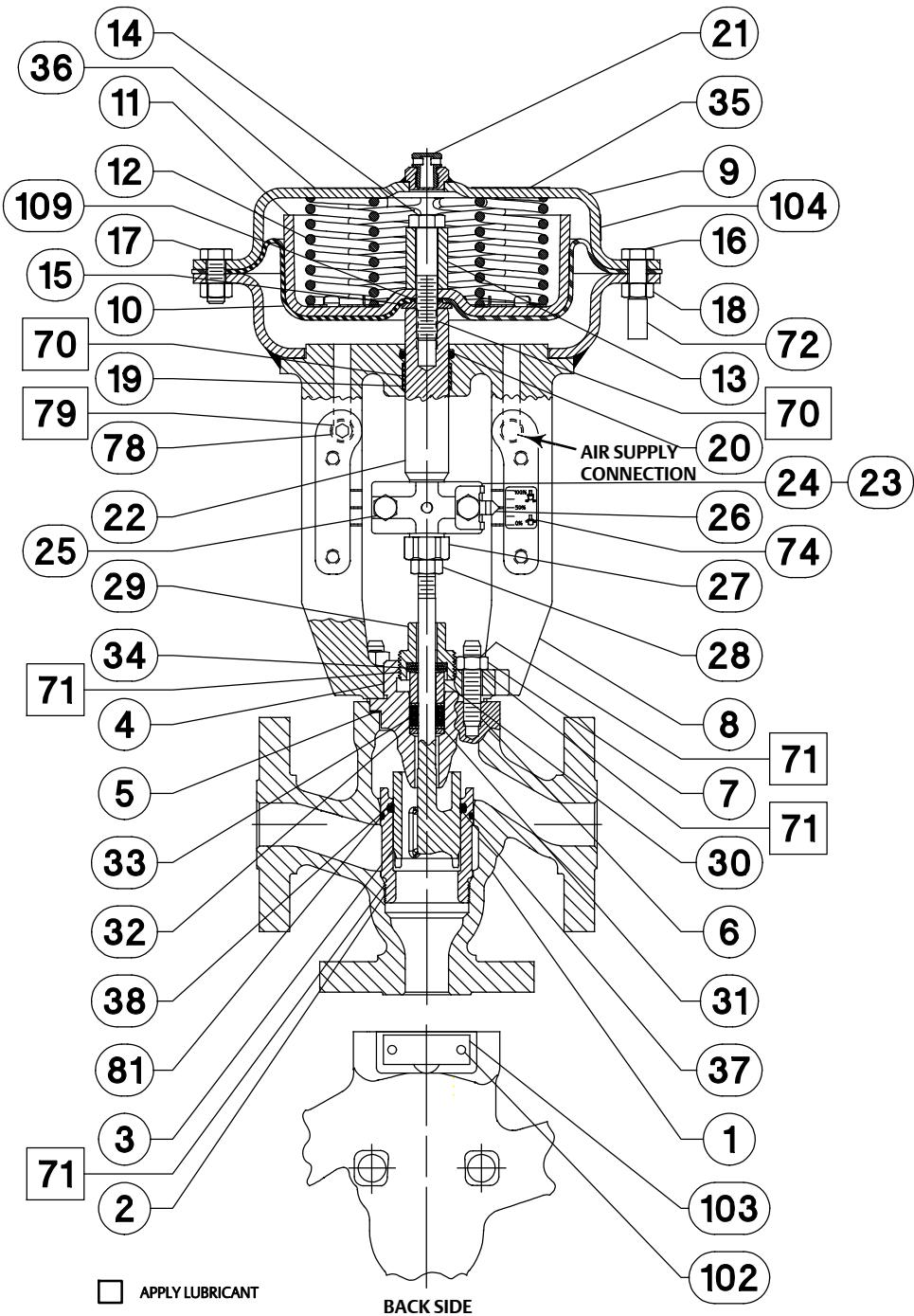
**Figure 9. Fisher GX 3-Way Side Port Common Trim Construction****SIDE-PORT COMMON****Figure 10. Fisher GX 3-Way Bottom-Port Common Trim Construction****BOTTOM-PORT COMMON**

Figure 11. Fisher GX 3-Way Control Valve and Actuator System Assembly, Fail-Down, Bottom-Port Common

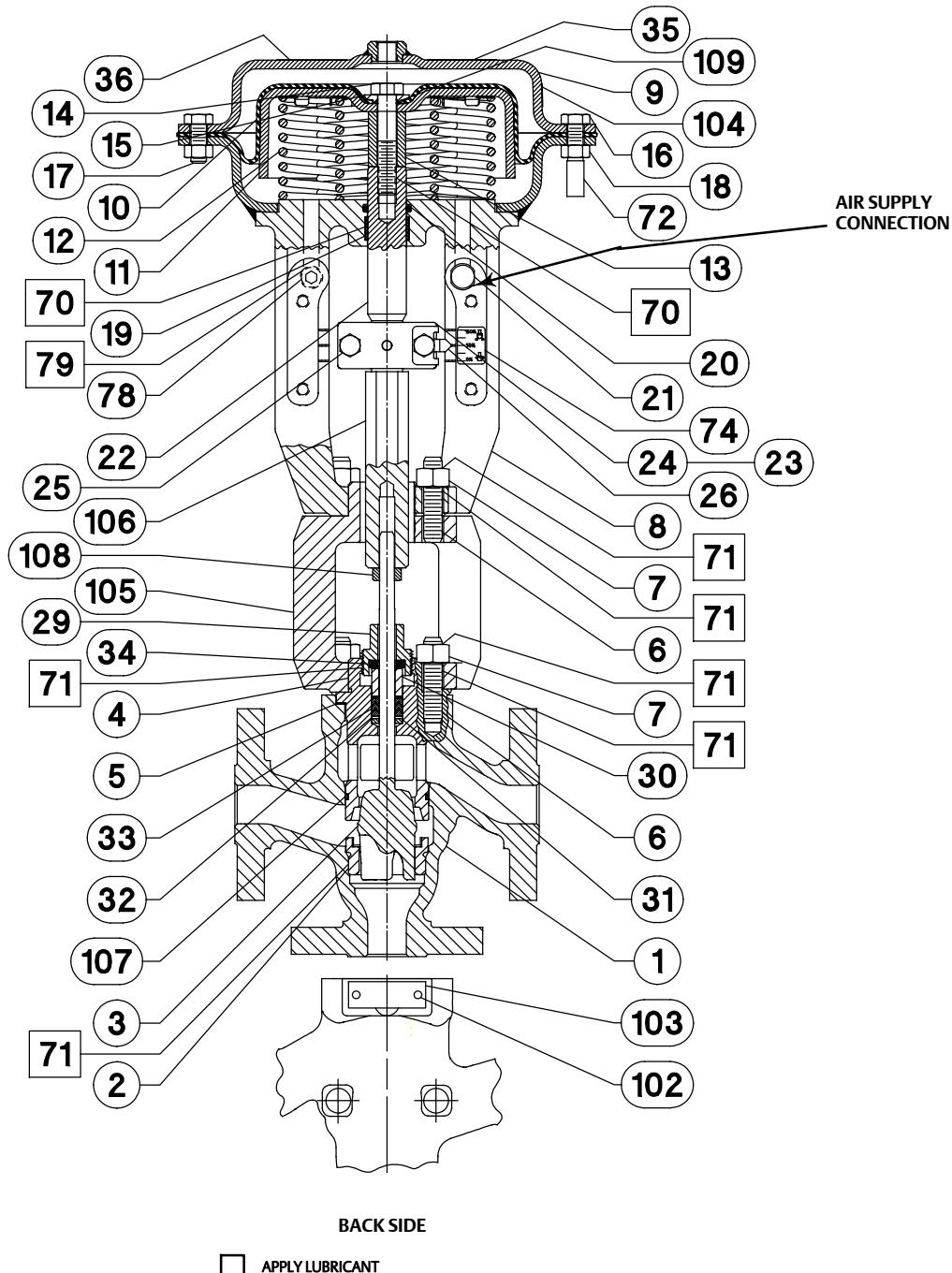
**BOTTOM-PORT COMMON**

GE35776-d

 APPLY LUBRICANT

Figure 12. Fisher GX 3-Way High-Temperature Control Valve and Actuator System Assembly, Fail-Up,  
Side-Port Common

**SIDE-PORT COMMON**

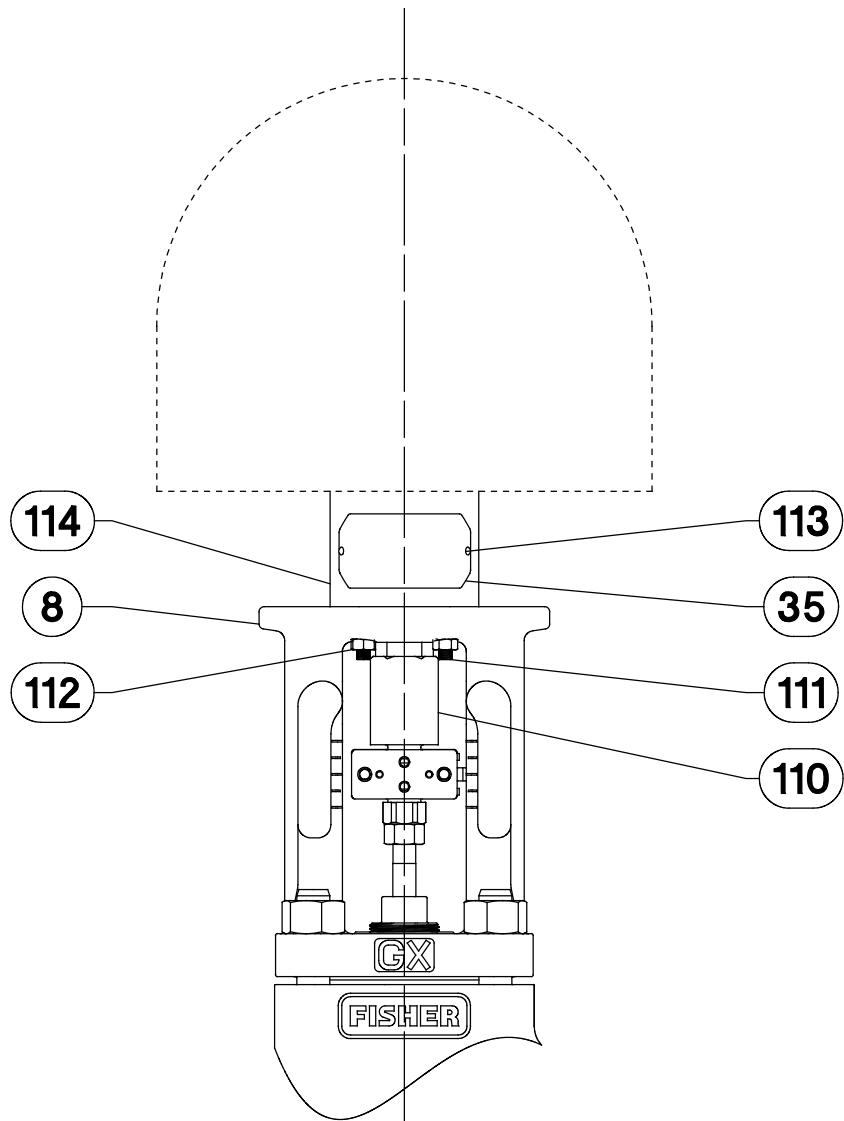


GE49204-C

 APPLY LUBRICANT

---

**Figure 13. Fisher GX 3-Way Electric Actuator Mounting**



GG12175-A

---



**Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.**

Fisher and FIELDVUE are marks owned by one of the companies in the Emerson Process Management business division of Emerson Electric Co. Emerson Process Management, Emerson, and the Emerson logo are trademarks and service marks of Emerson Electric Co. All other marks are the property of their respective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

**Emerson Process Management**

Marshalltown, Iowa 50158 USA

Sorocaba, 18087 Brazil

Chatham, Kent ME4 4QZ UK

Dubai, United Arab Emirates

Singapore 128461 Singapore

[www.Fisher.com](http://www.Fisher.com)